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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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Cover: The Spring thaw and melting snow feeds this stream along the Alaska Highway between Tok Junction and Horschway, with the Alaska Range in the background.

Editor: Robert D. Hostetter
Graphic Designer: Philip E. Kromas

Venturesome Volunteers Make a BIG Difference

by Bill Duddleson

- Deep in a remote canyon in southwest Idaho, Keith Taylor, Boise orthopedic surgeon and expert kayaker, installs a visitor registration box at a primitive campsite, puts his kayak back in the water, and rejoins a Bureau of Land Management (BLM) river patrol monitoring a 70-mile reach of the Bruneau River being considered for status as a Wild and Scenic River and Wilderness Area.

- Along the lower Colorado River in southwest Arizona, Don Pennie, who's just retired from Honeywell, Inc., as manager of a Minnesota plant that makes space-shuttle parts, pulls a pickup truck into one of the dozen campgrounds he inspects as part of his new assignment with BLM's Yuma District.

- In northern Nevada near Winnemucca, two leaders of the local Girl Scout troop—Sue Jourdin, homemaker, and Joyce Lacaillade, casino dealer, guide 46 Girl Scouts as they plant hundreds of willow trees along stream banks as part of a BLM project to control soil erosion and improve habitat for fish and wildlife.

- Somewhere west of Needles in southern California's Mojave Desert, Dennis Casebier, communications engineer, leads a caravan of 4-wheel drive enthusiasts as they build rock cairns to mark the 130-mile route of an almost forgotten 19th century wagon road they've traced across the desert. It traverses one of America's most magnificent desert scenic areas, including vast valleys of Joshua tree forests, and has been made accessible to 20th cen-

tury visitors as BLM's Mojave Road Recreational Trail.

- And in Billings, Montana, Cathie Luckinbill, senior geology student at Rocky Mountain College, works at a drafting table as she updates a coal-lease map for the Minerals Development Section of BLM's Montana State Office.

Although widely dispersed geographically and with diverse duties, these six people have something in common. They all are working with BLM but they aren't BLM employees and they aren't paid a nickle for their work.

They're volunteers, willing to undertake something extra, to try a new adventure.

Two years ago when BLM officials invited people to "make a difference as volunteers for

America's public lands," more than one skeptic questioned whether anyone would accept such an invitation.

What is happening, however, turns out to be something of a surprise to skeptics and advocates alike. The first year, 2,044 people accepted the invitation and served as volunteers with BLM. They contributed 152,489 hours of service.

Last year 3,318 persons contributed 258,522 hours of service—the equivalent of 150 work-years. That represents a 70 percent increase over 1982. The work they accomplished was worth \$1,511,117.

BLM's volunteer program is authorized by the Federal Land Policy and Management Act of 1976, which allows acceptance of



BLM Photo by Glenn R. Stewart

Retired campers (Snowbirds) volunteered to help build ramadas to shade picnic tables at the South Mesa campground in the Yuma Resource Area.

SOME TASKS FOR VOLUNTEERS

Recreation Management

Host a campground, maintain trails, assist river and desert rangers, provide information, interpret natural features and resource management, encourage considerate use, teach low-impact camping, monitor hiking in remote areas, assemble user data.

Cultural Resources

Survey prehistoric sites, assist with archaeological and paleontological excavations and restorations, search literature and summarize research, conduct tours.

Wildlife Habitat Management

Develop and install watering devices, fence riparian zones, conduct wildlife surveys.

Rangeland Management

Assist with range improvement projects, monitor livestock grazing, assist with forage surveys.

Wild Horse Management

Adopt a wild horse or burro, distribute adoption information, provide satellite adoption center facilities, help care for horses in adoption centers.

Forestry

Plant trees, assist foresters in timber sale preparation, report forest damage.

Mineral Management

Assist with geological surveys, monitor compliance with permits and leases, report unauthorized activities on mining claims.

Lands Management

Assist with land examinations, check compliance with permits and leases, prepare documents for resource management plans.

Water, Soil, and Air Management

Collect water quality data, assist in applying soil conservation measures, monitor success of air quality management.

Surveying

Cut brush for cadastral survey crews, locate survey corners, post lines.

Engineering

Keep culverts open, maintain facilities, erect signs, assist in locating new roads.

Fire Management

Assist in fire prevention projects, maintain fire equipment, reduce fire hazards.

Multi-Program Tasks

Coordinate a local program for volunteers, provide office support, conduct training and research, assist with environmental assessments, take photographs, write and design brochures, assemble reports.

contributed services. During 1982, procedures for recruiting and using volunteers were developed in cooperation with community service clubs, youth organizations, outdoor activity interest groups, and individuals. The Bureau's basic policy stated by Director Robert F. Burford calls for "managers of all units to actively take the initiative to seek out and recruit volunteers and other supplemental workers, and to utilize their services to the maximum extent feasible wherever a Bureau project, service or operation could thereby be accomplished, supplemented, complemented, enhanced or improved."

Each year, BLM managers identify their needs for volunteer and other contributed services, plan suitable projects, and establish priorities prior to recruiting.

Almost three-fourths of BLM's 3,318 volunteers during 1983 were attracted to renewable resource projects. These included improving fish and wildlife habitats (12 percent), rangelands (4 percent), forests (19 percent), and watersheds (2 percent); developing and maintaining trails,



Al Richards, a volunteer in the Arizona State Office, uses many years of experience prior to retirement in interpreting aerial photographs viewed in three dimensions through a stereoscope.



Peter Hodges, a volunteer selected by the Student Conservation Association, uses an increment borer to extract a core from a pinyon pine tree so he can count the growth rings and determine the tree's age.

BLM Photo by Deborah Hoback



Volunteers compare the amount of forage removed by livestock grazing with undisturbed forage plants in a caged enclosure to assist BLM range conservationists in determining appropriate levels of use and grazing systems.

campgrounds and other recreational facilities (22 percent), and protecting or restoring archaeological and historic sites (7 percent). Other volunteers provided administrative support (10 percent), lent a hand to surveying, engineering and other technical services (5 percent), assisted with mineral assessment and other energy and mineral resources tasks (4 percent), and also aided planning, public affairs, and wild horse and burro adoptions (4 percent).

Last year one-third of the volunteers were women and girls. Slightly more than half of all volunteers were between 18 and 54 years old; nearly one-third were less than 18; and the rest were 55 or older.

Are Volunteers Making a Difference?

The following examples illustrate how volunteers in many areas are improving BLM's capacity to get the job done.

In BLM's Arizona State Office, Al Richards, a retired U.S. Navy commander, is putting his 25 years of experience in aerial photography and remote sensing technology to use in a new way. As a BLM volunteer, he's guiding and assisting the State Office staff in interpreting satellite and aircraft images of BLM-administered lands

for resource planning and protection purposes. Says Dean Bibles, BLM's Arizona state director, "We not only couldn't afford to buy Commander Richards' kind of expertise, the high order of his technical knowledge and skill simply isn't available to us on the employment market."

Idaho's Boise District manages 1,350 square miles of wilderness study areas so that wilderness suitability is not impaired pending decisions of final wilderness status. "Volunteers supplement BLM personnel in monitoring the management of the areas," says Steve Addington, who developed the District's Wilderness Interim Management Plan. Last year, the District trained a cadre of volunteers who contributed 471 hours while conducting 15 weekend patrols. In addition to posting boundary signs and visitor registration boxes, they installed river gauges, discovered new archaeological sites, photographed and processed slides for use in wilderness reports. Addington pointed out that the participants gained "a better understanding of the Bureau's role in multiple-use management."

In southeast Oregon, 18 Izaak Walton Leaguers and Explorer Scouts assisted BLM wildlife biologists in bringing flying saucers to the Lakeview District. Five saucer-shaped, fiberglass rain

catchments about 15 feet in diameter were lifted into the area by helicopter. Wildlife using the saucers include many kinds of birds and animals for which water is a severely limiting factor in the high desert, Alan Munhall, BLM wildlife biologist, said.

Throughout the West in 70 localities, 247 college-student resource management assistants recruited by the Student Conservation Association served with BLM last year. These summer volunteers worked 12 weeks on para-professional projects that ranged across the spectrum of BLM resource management activities. During 1984, opportunities will be available for more college-aged volunteers.

BLM's Yuma Resource Area, in the southwest corner of Arizona, last year had what sure looked like a problem. Its 300 miles of Colorado River shoreline and 8,000 square miles of desert normally attract 1.7 million visitor-days of recreation use, mostly in the winter when the climate is just right. Most of the area's facilities are used by "Snowbirds"—migratory winter visitors, retired couples for the most part, who escape the snows of the north by following the sun to the southwest.

Jill Welch of BLM's recreation staff met with a group of Snowbirds to explain the need for



BLM Photo by Kevin Freeman

Volunteers build a stone cairn to mark the route of the trail which follows the old Mojave wagon road in southeastern California.

help in maintaining campgrounds. "Their response was immediate and heartwarming," she said. "Twenty-five volunteered to serve as an "adopt-a-potty" crew, and they maintained seven sets of toilets all winter. Our volunteer agreements with these older folks went without a hitch."

A local rod and gun club asked BLM officials why trash was being allowed to build up along the river shorelines. Trash removal became the next project for volunteer recruitment. BLM staffers challenged the club members to take responsibility for it themselves. They responded by making twice-a-week trash collection patrols along 20 miles of the most heavily used shoreline using their own pickup trucks and gas.

Next, the staff asked for volunteers for a construction crew to build ramadas (shaded picnic tables). Again, a flock of Snowbirds responded. "The crew of six regulars, plus intrigued drop-ins, put up four ramadas in a month. Reports Jill Welch, "They poured the concrete, did the

carpentry, the painting, and everything else, under the supervision of a BLM employee. They were on the job six to eight hours a day, often including weekends, and their work was professional in every respect." In addition, seven volunteers served as campground hosts.

This year, according to Yuma area manager Allan Belt, "We're absolutely counting on volunteers to successfully run the campgrounds and most of the recreation program. They're carrying the main load in informing the public of our new campground permit program, and issuing permits. We also have volunteers planting trees, greeting visitors at our front desk, and producing a Snowbird Gazette."

Who Pays the Price?

BLM's costs associated with volunteer projects are paid by the benefiting activities. For instance, if a fisheries biologist in Oregon's Coos Bay District proposes a volunteer project to remove debris in a coastal stream to permit salmon migration to spawning beds, project costs would be charged to funds available to that District's wildlife habitat management account. Costs could include mileage to drive a volunteer crew to and from the work location, as well as tools and supplies.

BLM receives no additional Congressional appropriations for its volunteer program. Last year, managers estimated that benefits from work accomplished in volunteer projects exceeded costs by about five to one.

Roles and Responsibilities

The responsibility to use the services of volunteers to advance BLM resource management programs follows the usual chain of command. It flows from the Director to the Deputy Director for Management Services (and his Assistant Director for Technical Services) to the State Directors,

District Managers, and Resource Area Managers. At the project level—where the action is—supervision and guidance of volunteers is the responsibility of staff professionals who are specialists in the kinds of activity involved, such as wildlife habitat management, forestry, range conservation, or recreation management.

One particularly promising approach pioneered under a six-month volunteer agreement with Don Pennie calls for him to serve as the volunteer coordinator of the volunteers program in the Yuma Resource Area. This retired plant manager devotes 40 hours a week to recruiting other volunteers and coordinating their work.

Why Volunteer?

The reasons for volunteering are as numerous as the volunteers, and their rewards take many forms.

College students often use one word—experience—to describe what they get in return for working without pay. They mean on-the-job work experience in the professions they have chosen or are considering. They appreciate being able to work alongside BLM people in those professions, so they can learn first hand what will be expected of them after graduation.

Older volunteers gain personal satisfaction in working together to accomplish something that will be enjoyed and appreciated by others. For example, the volunteers who cleared rocks and brush from an old wagon road to convert it to a recreation trail in California's Mojave Desert worked as a group called friends of the Mojave Road. With the trail cleared, marked, and mapped, the volunteers have the satisfaction of knowing that visitors can use the trail and guide book to enjoy desert landscapes, plants and animals as a result of their cooperative venture.

Dennis Casebier, leader of the group, said, "I'm deeply impressed with the diverse backgrounds, skills, and talents of the volunteers." He added, "The richest reward of all is to see these very special people step forward to do what needs to be done."

Don Pennie, the retired plant manager from Minnesota, said, "I want to continue to work with other people to accomplish useful, positive things. Besides, I like winters around Yuma better than those in Minnesota."

Jack Page, who helped keep the Colorado River shoreline free of litter, said, "We want to keep this area in trust for our grandchildren—for all grandchildren."

BLM's Jim Welch said that the Snowbirds and all-year neighbors, too, are proud of their independence but welcome the chance to protect the desert and river as a service to others.

Volunteer Agreement

Volunteers enter into agreements with BLM that specify the work they are to perform,

hours of duty, logistical arrangements, and duration of the agreement. The general purpose of the agreements is to reach mutual understandings. There usually is flexibility enough to match each volunteer's preferences, skills, and time with projects to be undertaken.

Volunteer Protection

While volunteers are not BLM employees, they are eligible for compensation for job-connected injuries. Likewise, volunteers are covered by the Federal Tort Claims Act in the same manner as regular Federal employees.

Commencing this year, BLM managers have the authority to reimburse volunteers for some of the expenses incidental to their volunteer service, such as car mileage, if covered by the volunteer agreements and funds are available. Volunteers also can claim unreimbursed expenses they incur for their specified volunteer work as contributions in their Federal income tax returns, within limits allowed by the Internal Revenue Service.

How to Apply

BLM's 12 State Directors, 55 District Managers, and 153 Area Managers seek volunteers with a wide range of backgrounds, skills, and work preferences. Volunteers may work only a few hours or days a week, during a particular season, to complete a certain project, or full-time.

There are no restrictions on who can volunteer, except that persons under 18 years of age need written consent of parent or guardian.

To explore opportunities, prospective volunteers should contact the volunteers work program coordinator in BLM offices in the localities where they would like to work and ask for a volunteer's application form. BLM offices are listed in telephone directories under United States Government, Department of the Interior, Bureau of Land Management. Addresses of BLM's State Offices are listed on the back cover of "Your Public Lands." ▽

Bill Duddleson is the volunteers program coordinator in the Bureau of Land Management's Headquarters Office in Washington, D.C.



BLM Photo by Kevin Freeman

Volunteers clear brush and rocks from the old Mojave wagon road as one step in converting it to an interpretive trail, complete with guide book.

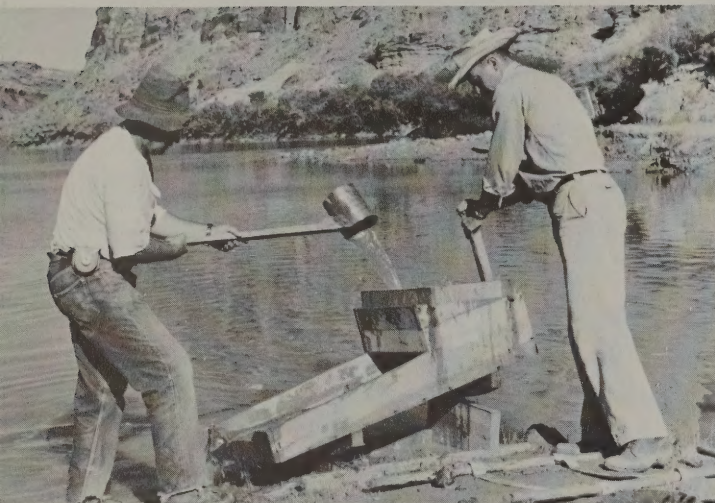


BLM Photo by Glenn R. Stewart

Jill Welch, Yuma Resource Area recreation planner, discusses work projects with Don Pennie, who volunteered to work 40 hours a week coordinating the Area's program for volunteers.

Locatable Minerals, Treasures for the Finders

by Jeff Williams



A cradle is used to separate particles of gold from sand on a placer mining claim.

It is surprising to many people to discover that the rights to some of the most valuable and treasured minerals known to man can be legally obtained by simply "staking a mining claim" on the public lands and submitting a filing fee of \$5. Minerals for which mining claims may be "staked" or "located" are known as the "locatable" minerals in contrast to the "leasable" or "salable" minerals. The locatable minerals encompass a vast array of mineral commodities found in our daily life. Gemstones and metals such as gold, silver, copper, diamonds, and turquoise are locatable. Some industrial minerals, are also locatable. Limestone and zeolites, for example, are used for purposes as diverse as steelmaking and laundry washing. Most of the critical and strategic minerals, like cobalt and chromium, are locatable. Uranium is an example of a locatable mineral that is an important energy source.

Mineral Values

The contribution to the economy, national security and industrial strength of this country from development of locatable minerals has been and continues to be significant. Many major mineral deposits have been

discovered on public lands, some of which are still mined today. The original mining claim for the Homestake gold mine at Lead, South Dakota, was located April 1876. Total production through 1965 amounted to 6,554,249 troy ounces of silver and 27,961,276 troy ounces of gold, worth over \$10 billion at today's prices. The discovery of the Mi Vida Uranium mine by Charles Steen in 1952 quickly transformed this penniless geologist into a rich man. This mine and others which form the Big Indian Ore belt in southeastern Utah accounted for over eight percent (100 million pounds) of the uranium oxide mined in the U.S. up to 1965. Furthermore, the Department of Energy estimated in 1981 that over half of the uranium reserves in the country occur on Bureau of Land Management or Forest Service land. There are hundreds of similar examples of large mines discovered on public lands throughout the western states,

After determining that the land is open to mineral entry, discovery of a deposit of a valuable mineral is the next step in locating a mining claim.



such as the Bingham Mine in Utah, the Berkeley pit in Montana, the copper deposits in Arizona, and the Climax Molybdenum Mine in Colorado, to name but a few. In 1982, almost the entire domestic production of molybdenum, copper, gold, silver, nickel, tungsten, vanadium, and barium came from either patented or unpatented mining claims. The production value for these minerals was \$3.4 billion.

Locatable minerals are managed by BLM under the 1872 mining law. This law was enacted to encourage people to develop this Nation's mineral resources, resulting in the settlement of many portions of the West. Under the law all valuable minerals in lands belonging to the United States are "free and open to exploration and purchase." The mining law does not provide for the Federal Government to receive rent or royalties from locatable minerals, but tax revenues run into billions of dollars. The absence of rents and royalties serves as an incentive for the mineral industry to search for and produce these minerals. Most of the locatable minerals occur in isolated veins or pods which are extremely difficult to pinpoint. The Congress recognized the difficulty and expense in finding such deposits and wrote the mining law to provide rewards for such a difficult and uncertain venture.

Location System

The location system as established by the mining law was based on a combination of local customs and regulations of Western mining camps, the Spanish royal code of 1783, and the mining traditions of England and Germany. The law was written in response to mineral exploration and development which began in earnest with the California gold rush in 1849. The law has been amended several times since 1872; however, the "free and open" philosophy re-



This open-pit copper mine in Arizona originated with mining claims on Federal land.

mains intact for the minerals still administered under the law. When enacted, the law applied to all valuable minerals, except coal which was already being sold by the Government. Major amendments to the law include the passage of the Mineral Leasing Act of 1920 which established a leasing system for oil, gas, coal, sodium, potassium, phosphate, and sulfur on public land. The Materials Act of 1947, as amended by the Surface Resources Act of July 23, 1955 (Public Law 167) provided for the disposal of common varieties of sand, stone, gravel, cinders, pumice, pumicite, and clay. The Surface Resources Act also subjected mining claims to the right of the United States to manage the surface resources. There have been other revisions to the mining law such as the Federal Land Policy and Management Act of 1976 (FLPMA) which requires the recordation of mining claims with BLM and the prevention of unnecessary and undue degradation of the lands affected by mineral operations. FLPMA also established special requirements of mining claims in the California Desert and in BLM's Wilderness Study Areas.

Mining Claim Records

Rights to locatable minerals are initiated by the discovery of valuable minerals and the staking of a mining claim. According to BLM records, there have been approximately 1.7 million mining claims recorded since required recordation began with the passage of the Federal Land Policy and Management Act (FLPMA) in October 1976. Of these, approximately 1.3 million are still active, and are held by approximately 90,000 claimants, ranging from individual prospectors to large corporations. BLM estimates that approximately 35 percent of all claimants hold only one mining claim and almost two-thirds of the claimants hold five or fewer mining claims. The records show that about 95-98 percent of the claimants qualify as small businesses. Larger businesses are also important because they hold the majority of the claims. In fact, about four percent of all the claimants hold almost two-thirds of all mining claims.

The mining law requires that prior to locating a mining claim a discovery of a valuable mineral deposit must be made within the boundaries of the claim. The

meaning of "a discovery of a valuable mineral deposit" has been defined through various Department of the Interior and judicial decisions. The most often quoted decision, *Castle v. Womble* 19 L.D. 455 (1894), established "the prudent man rule" which was stated as follows:

... where minerals have been found and the evidence is of such a character that a person of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success in developing a valuable mine, the requirements of the statute have been met.

The staking of a mining claim begins by distinctly marking the boundaries on the ground in a manner so that they can be readily traced. The method of staking a claim is controlled by state law but in most states a claimant will mark each of the four corners and the discovery point. The notice of location will typically be posted at the discovery point and will state the date of location, the name of



Mining claim posters are used to indicate the discovery point and boundaries of claims.

the claim, and the name(s) of the claimant(s). Prior to staking a claim the claimant should always check with the local BLM office to ensure the land is Federal and open to location.

There are basically two types of mining claims: lode and placer. Lode claims can be no larger than 600 by 1500 feet (approximately 20 acres) and are located along veins or lodes of rock in place. Placer claims are commonly

located for gold occurring with sand and gravel deposits which have been transported by streams. Placer claims are also used for certain bedded deposits such as bentonite, limestone, and gypsum. Placer claims are usually located by legal subdivision and cannot exceed 20 acres per claimant up to a maximum of 160 acres for an "association placer" held by eight or more claimants.

The Mining Law as amended by FLPMA requires that once a mining claim is located on the ground, it must be recorded in the county and with the appropriate BLM State office. A one-time fee of \$5 must be submitted to BLM with each notice of location. County recordation fees vary from place to place.

Assessment Work

Claimants are required to perform at least \$100 worth of labor or improvements on each claim each year. This assessment work must lead toward the eventual development of minerals from the claim or claim group and work may be done on one claim if it will benefit all claims in a group. An affidavit stating that this work was completed must be filed in the county and with the proper BLM State Office by December 30 of each year.



Location of mining claims in Idaho and extensive test drilling preceded the construction and operation of this molybdenum mill.

This marker denotes the boundary of a mining claim in Utah.



Surface Protection

Since the passage of FLPMA, BLM has assumed an active role in managing surface resources during locatable mineral operations. Subsequent regulations (43 CFR 3809) provide BLM the opportunity to monitor mining operations so as to prevent undue and unnecessary degradation and to require reclamation. Other regulations are applicable in wilderness study areas. BLM has received and reviewed over 6,000 notices and plans of operations in the three years since the regulations became effective. A notice is required of a claimant who will be disturbing less than five acres. A plan of operation is required if a larger operation is anticipated or if work is to be done in certain designated areas. In order to save time and expense, it is strongly suggested that operators contact the appropriate BLM District Office for guidance in preparing a notice or a plan of operations.

While holding a claim, the claimant acquires certain rights against all others, including the Government. However, the Surface Resources Act gives the Government the authority to manage the surface resources in a manner which will not interfere with mineral development on the

claim. This means that the Government may lease the area for cattle grazing, the development of leasable minerals, or grant rights-of-way. A mining claim is to be used only for the purposes of mining or milling. There have been numerous instances where individuals have attempted to establish residences on mining claims. These attempts result in eviction of the claimants if claims are invalid or if residence is not necessary in the conduct of mining operations. This has been a

serious problem in northern California and Oregon.

Upon discovery of a "valuable mineral deposit" the claimant(s) may purchase the claim (surface and mineral rights) for \$5 per acre for a lode claim and \$2.50 per acre for a placer claim. If BLM determines the land to be valuable for leasable minerals, they will be reserved to the United States. Upon meeting the requirements of the law, the claimant will receive a patent or deed to the property which then becomes private land. Last year, 816 claims were patented encompassing 15,140 acres.

In summary, the Mining Law of 1872, as amended, has provided and continues to provide a great incentive for the development of Federal locatable mineral resources. These minerals are essential in manufacturing innumerable products, provide jobs and add to the economy, contribute to international commerce, and enhance national security. ▽

Jeff Williams is a geologist in the Division of Mining Law and Salable Minerals in BLM's Headquarters Office, Washington, D.C.



In this commercial placer mining operation on a gravel deposit in Alaska, the material is conveyed to a series of riffles designed to separate particles of gold from sand and gravel.

Surveying in the 1980's— Plodding Becomes High Tech Plotting

by Robert D. Johns

Laser beams, light waves, satellites, microwaves, photogrammetry and gyroscopic orientation are causing change in land surveying. Measuring tapes, compasses, and solar transits, while not yet considered as museum pieces, are beginning to collect dust on the shelf as new, more accurate, high tech equipment brings exciting changes to an occupation dating back to biblical times.

Rather than loading up the horses and mules with equipment and life-sustaining provisions for month-long trips into desolate areas as was still done early in this century, today's surveyors load state-of-the-art equipment on jet powered helicopters. They now do in days what formerly took months, and with greater accuracy, too.

There are numerous ancient documents which refer to surveys. One of the oldest such documents is a 5,000-year-old Assyrian clay tablet with a map inscribed depicting a survey of what is now Iran. Surveyors insist, however, that the occupation can be inferred to go much farther back in time. Some suggest that it evolved when man first felt the desire to possess land. And land possession inevitably led to a need for defining boundaries and property lines.

Early surveying measurements were generally approximate, owing to their reference to parts of the body. A cubit, referred to many times in the Bible, was the length of a man's arm from his elbow to his finger tip, about 18 inches. A span was the reach of a man's outstretched hand from thumb tip to finger tip, about nine inches. Two spans equalled one cubit. A reed, another measuring



The Initial Point of the Public Land Survey System is located near the city of East Liverpool, Ohio, on the north bank of the Ohio River and the western boundary of Pennsylvania. Jerry R. O'Callaghan, former chief of BLM's Office of Legislation and Cooperative Relations, participated in the ceremony to dedicate the national historical monument on September 30, 1966. Other ceremonies are planned for 1985 to commemorate the bicentennial of establishment of the system.

instrument, was six cubits long.

But practical measurements weren't always very accurate and, as the need for greater accuracy increased, so did refinements in the units of measure. The surveying chain, still used under special circumstances today, was developed to meet that need. The chain is comprised of 100 links totalling 66 feet in length. The chain is a decimal system and also relates directly to acreage. For example, 80 chains equal 5,280 feet, or one mile, and an area 80 chains by 80 chains equals 6,400 square chains, which when divided by 10 coverts to 640 acres per square mile.

In addition to refinements in the units of measure, surveying techniques also improved. One of the early breakthroughs involved the concept of triangulation, which is

a way of surveying a large area with the aid of calculations. This method is based on the fact that if the length of one side of a triangle and two angles are known, the lengths of the other two sides can be determined. The formula for triangulation was first known to be published in 1533 by Gemma Frisius but was not put to use until around 1615 when a Dutch mathematician named Willebrord Snell used it to determine the arc of a meridian.

Surveying in the early days of America was based on a system of metes and bounds. A person would lay out his landholdings in any configuration he wished, using distances and directions from land features to describe the boundary. However, another system supported by many in New England also became

popular. This method, called the rectangular system, used boundary lines running north-south and east-west. A bitter debate between the rival factions followed with the result being the Ordinance of 1785, which requires public domain land to be surveyed by the rectangular system prior to settlement. Public domain land was that owned by the Federal Government, and did not include land within the 13 Colonies.

Surveying the public domain is the responsibility of the Bureau of Land Management in the U.S. Department of the Interior. The present system of land surveying, or cadastral surveying, still generally follows the Ordinance of 1785, although refinements have been incorporated.

Under the cadastral system, land is surveyed in a grid of squares, each approximately six miles to the side, called townships. Following the principal meridian and base lines, which intersect at the point of beginning, the surveyor sets markers every one-half mile and township markers at six-mile intervals. This creates 36-square-mile townships. The township is further divided into sections or one-mile squares containing 640 acres. The townships can be identified by their relationship to the baseline and the sections are identified by a numbering system that starts with section 1 on the northeast corner of the township and ends with section 36 in the southeast corner.

But while this system sounds simple, it was often difficult to execute. Marking boundaries with straight lines running north-south and east-west is a disarmingly simple concept, but establishing such a boundary on the land is another matter. First, it is difficult to mark a perfectly straight line for several hundred miles across rough terrain and through all kinds of vegetation. Another problem is the curvature of the earth which causes the lines running north and south to draw together as they approach the poles. In a single sec-



Theodolites and laser range poles add to the capabilities of magnetic and solar compasses.

tion, the convergence would not make the section notably out of square but when the lines are extended over greater distances, the distortion can become sizeable. For this reason, surveyors measuring along the principal meridian established what is called a correction line, generally after every fourth township.

Another problem in early surveying times involved determining the direction of true north. When using compasses to determine direction, surveyors always had to keep in mind that the compass needle always pointed to the magnetic north, an area sometimes west or east of the north pole. But because the difference between true north and magnetic north was known, corrections could be made. However, inaccurate readings caused by anomalies such as deposits of iron, were more troublesome. Several large deposits of iron, however, were discovered by the erratic readings caused on magnetic compasses.

The shortcomings of the magnetic compass were overcome by a device called a solar compass.

The solar compass was based on a principle astronomers and navigators have known and used for ages—the relationship between the sun and the earth. By using the solar compass and a publication known as the “ephemeris,” which shows the daily and hourly declinations of the sun, the surveyor can determine directions and his location on any given day and hour.

Much like the magnetic compass gave way to the solar compass, now the solar compass has given way to several other measuring techniques and devices.

One system which is being increasingly used is based on data from orbiting satellites. Through the system, the latitude and longitude of electronic receiving devices on the ground can be determined based on signals generated by the satellite and through telemetric computations. The accuracy of the data is dependent upon the number of passes by the satellite used in the computations and by the angle of the satellite to the receiving station.

Once these selected reference points are established through

satellite information, the distance to other points can be determined through the use of various electronic distance measuring devices and techniques. In many cases, distances can be determined using radio, laser and infrared beams which are directed to prism/reflector located from a few feet to 80 miles away. The distance is computed automatically based on the time it takes the beam to return to the sending unit after striking the prism/reflector.

Once the distance between the survey points is determined, a device called a theodolite is used to measure the angle between the survey points and true north. When the angle and distance from the reference point are known, latitude and longitude can then be calculated.

These two measuring concepts, involving angle and distance measurements, have been combined in recent years into a unit referred to as a total station—a combined unit which reduces weight, setup time, and costs, as well as providing automatic distance and angle measurements with increased efficiency.

Another type of surveying equipment, called an auto-surveyor, received its impetus for development as a result of surveying needs in Alaska. Congressional legislation granted more than 200 million acres of public domain land to the State of Alaska; to native Eskimos, Indians, Aleuts; and for national parks, wildlife refuges, and national forests. Before any of this land could be transferred and titled, boundaries had to be surveyed and legal descriptions provided. It would have taken many years to complete surveys with ground crews, chains, and transits. So again, necessity proved to be the mother of invention. A new technique, adapted from the guidance systems used in airplanes and space vehicles, was developed for surveying needs.

The new system, using an auto-surveyor, establishes geographic

positions by combining the principles of a gyroscope, an acceleration measuring device, and specially designed computers. A computer, which has been fed appropriate data about the starting location, records acceleration data and reactions of the gyroscope to horizontal and vertical movements of the helicopter in which the equipment is mounted. Data are then translated into distances and directions which tell the operator his exact location in terms of latitude and longitude. Once a corner placement is determined using this method, a fluorescent marker is dropped from the helicopter. Final placement of an official marker is made by ground crews.

The electronic field note book is another new product being tested that offers considerable promise. This recorder-like device collects and stores data from each day's surveying activities, which then can be fed into a computer and used to meet varying needs.

Even with all the new electronic, space-age technology, surveys still depend on the knowledge, experience, skill, and intuition of the people who are cadastral surveyors. At present, most of their work in the lower 48 states involves resurveys. These are necessary to reestablish corners that may have been lost or obliterated during the century or

more since they were established. However, a resurvey must be tied to an existing corner. Study of original survey notes helps in the search for old survey monuments, such as wooden stakes or stones, and for bearing trees scribed to witness the corner location. Currently, iron posts with brass caps stamped with identifying numbers are used to mark survey corners in the rectangular survey system.

Surveys to delineate and describe the public domain, two-thirds of which passed into private ownership, shaped the pattern of America. The next time you're in an airplane flying across the Nation, you will realize that the neat pattern of squares and rectangles is attributable to the Land Ordinance of 1875 and to meticulous and persevering cadastral surveyors.

To recognize the contribution that surveying has made to the growth and development of the United States, President Ronald Reagan declared the week of March 11, 1984 to be National Surveyors Week. ▽

Robert D. Johns is a public affairs specialist in the Headquarters Office of Public Affairs in Washington, D.C.

Electronic distance measuring equipment replaces link chains and steel tapes.



VisionQuest

by Mark H. Davis

The moon was full and there was a bite to the air. The clothes I usually wear for fall hunting were not sufficient to keep me warm. I felt I was out of time and place as I observed the silhouette of the VisionQuest wagon train encampment through the windshield of my four-wheel-drive pickup.

The VisionQuest circle of wagons and tipis seemed more in place with the remote Nevada desert landscape than my truck. In the center of the circle was a roaring fire surrounded by young men and women. They knew how to survive a cold desert night.

Nevada is classified as cold desert, the land is wide open, the wind blows constantly, population is sparse, and the predominant use of the land is ranching and mining. Compared to many of the more populated states east of the Mississippi, much of the state is virtually uninhabited. Sixty-nine percent of the entire state of Nevada is public land under federal management by the Bureau of Land Management (BLM).

Nevada's population of wild horses and burros is the largest of any state in the Union. Through the Bureau's adopt-a-horse program, VisionQuest is now utilizing wild horses as therapy for delinquent juveniles as well as providing "horse power" for the wagon train entourage.

Wagon Trains and Wild Horses

VisionQuest has several wagon trains running continuously, criss-

crossing the entire country. In the Bicentennial year, a wagon train rolled into Washington, D.C. and the youths met the President. Located in Pennsylvania, VisionQuest's eastern office has adopted more than 30 wild horses. VisionQuest also put on several exhibits for Wild Horse and Burro Week (October 17-23, 1983) held at BLM's Lewisberry, Pennsylvania, Adopt-A-Horse center. In front of several thousand spectators, the youths demonstrated how they gentled and trained wild horses.

VisionQuest is a private, profit-making organization that has developed a unique approach to handling juvenile delinquents. Working with young men and women for over 10 years now, VisionQuest estimates that more than 70 percent of the youths that participate in their programs are never again detained for juvenile offenses.

The philosophy behind the wagon train program is the Plains Indian's "Rite of Passage" in which youths must earn the privilege to be accepted into the adult community. Delinquent juveniles must decide to accept the hardships and responsibilities of participating in the wagon train. Life is not easy; it involves hard work, schooling, and extreme weather conditions. The youths learn to accept and cope with themselves as well as the set of rules established by the adult community and thereby earn the "Rite of Passage" into adulthood in today's society.

Wagon drivers are responsible for the proper treatment and well-being of the pulling stock. Intentional mistreatment or improperly fitting a harness can bring a harsh punishment, such as walking in front of the wagon train rather than riding in a wagon.

Pulled by horses or mules, the wagon trains make 9-17 miles per day. Travel is slow and rough; wagons do not have cruise-control, coil springs, or heat. They are authentic duplications of the wagons used by pioneers to discover the West. Scouts on horseback don red vests and flags to warn traffic of the slow moving train.

Several of the scouts ride horses that were once wild and free-roaming on the Nevada rangeland. Removed from the public lands administered by BLM to prevent environmental deterioration by over population, the wild horses now make excellent riding stock. In the summer of 1982, a stationary camp was set up two months journey ahead of one wagon train. At that location, selected youths assisted in breaking wild horses. Norman Person, nine-time world champion bronc rider, guided the youths as they gentled and trained the horses. The youths learned horsemanship as well as shoeing and leather craft skills. Several youths went on to become blacksmiths after the two-month camp. When the wagon train arrived at the stationary camp, the wild horses were incorporated into the train.

Animals play a key role in teaching responsibility. According to Rick Zasa, VisionQuest wagon master, "Some of our best therapists have four legs. These kids soon learn that they cannot con a mule the way they've conned their parents and teachers. Angry, stubborn kids may be teamed with equally stubborn animals. They learn in a hurry that in order to master the animals they must control their own anger."

Camping Places

The wagon train I visited was slowly moving across the desert. At one point between Elko and Eureka, the train crossed the route of the Pony Express. A BLM historic marker indicates the still visible trail over which mail was carried in 1860-61. One night was spent at the fairgrounds in Eureka. The fairgrounds are BLM lands administered by the County of Eureka under the Recreation and Public Purposes Act. Another night was spent in Kobeh Valley just south of BLM's 15,000-acre Roberts wilderness study area. A third campsite was located not far from Austin, near the BLM Hickison Petroglyph recreation site.

Each youth is part of a tipi family. The family functions as unit; members have specific roles and responsibilities. Counselors are an integral part of the family and provide necessary guidance and discipline. At least four hours a day are spent on education. Sub-

jects often include those necessary to achieve a high school diploma.

One youth said the VisionQuest program "gets down to the basics." This particular young man was the mastermind behind the physical theft of his high school's computer system. A new participant on the train, he likes the program because "lock-up is not kids."

After taking the silhouette picture, I started my truck, turned the heater on high, and headed for my warm motel room. I could not help but feel compassion for youths (and counselors) as they huddled around the campfire. The wind was blowing at least 10-15 miles per hour, snow was beginning to fall, and the temperature was already near freezing. The thought of crawling into a sleeping bag on the floor of a tipi made me shiver. ▽

Mark H. Davis is a wildlife management biologist in BLM's Battle Mountain District in Nevada.



Canvas-covered wagons and tipis provide the only shelter, regardless of weather, for VisionQuest travelers.

Fizzing Up Tired, Old Oil Wells

by Carolyn Z. Roth

In the southwest corner of Colorado, several major oil companies are interested in an uncommon natural resource, namely carbon dioxide, that happens to occur beneath the surface of the land. Since it occurs in an area for which the Bureau of Land Management (BLM) is responsible, BLM manages its use, along with the use of other resources, including rangeland, minerals, recreational opportunities, and cultural resource values.

Through noncompetitive, negotiated leases, BLM is allowing the recovery of the carbon dioxide. Sounds easy so far. The "kicker" is that the highest concentrations of carbon dioxide are found in an area that has some of the richest remains of cultural resources. On Mockingbird Mesa, where extensive drilling is occurring, BLM has identified more than 100 cultural sites per square mile. The sites range from large Anasazi Indian villages to lithic and ceramic scatters.

Kristie Arrington, archaeologist in the San Juan Resource Area, Montrose District, describes how BLM and industry have been cooperating. "We've been involved from the very beginning. On-the-job coordination protects cultural resource sites." She adds, "In fact, the contractors hired six archaeologists to work right alongside the construction crew."

Exploration and Development

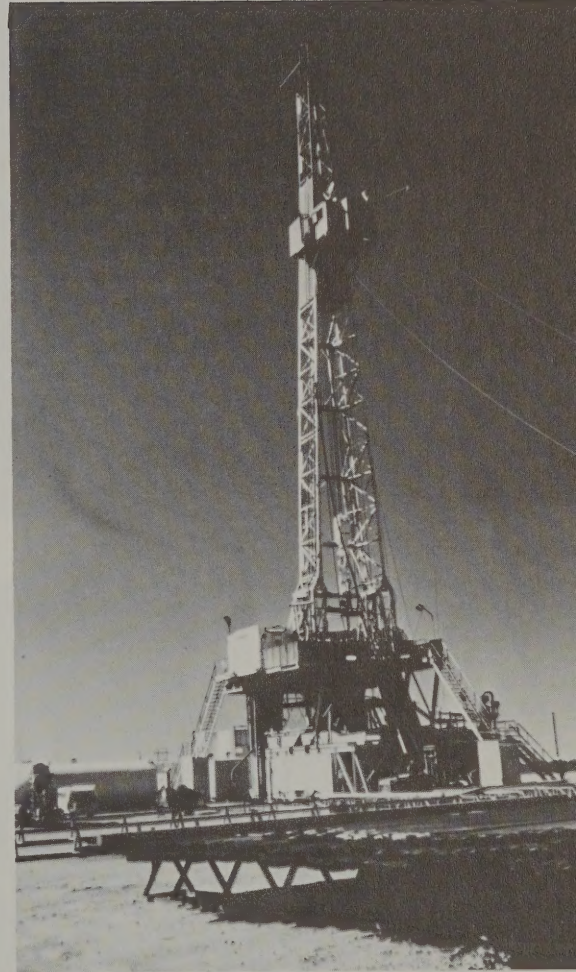
Exploratory well-drilling to identify the presence of carbon dioxide reserves began in 1976 in southwestern Colorado. Shell Oil Company is the largest working interest owner and operator.

Other large interest owners include Mobil, Conoco, Texaco and Exxon.

After more than three years of testing and ten years of research and engineering, Shell Oil Company is constructing a project to recover carbon dioxide near Cortez, Colorado. Plans are to transport the gas via a 495-mile pipeline to the Wasson oil field in west Texas. The carbon dioxide will be used to recover oil that waterflooding methods have left behind. This is the world's largest enhanced oil recovery project using carbon dioxide. Carbon dioxide, when injected at high pressure, mixes with oil, while water does not. Since oil and water do not mix, waterflooding leaves a large amount of oil trapped in the rock pores. Carbon dioxide will mix with this remaining oil by solvent action, and can increase recovery by one-third.

Under present plans, Shell will drill forty wells in the source fields prior to startup. At full production, 120 wells will be operating. There will be a main facility where a 30-inch diameter pipeline will originate, and six additional central facilities—three on BLM and three on private land. Special equipment in the central facilities will separate water from the carbon dioxide as it is pumped from the ground.

The Wasson field in Texas will be the first large user of southwestern Colorado carbon dioxide, and will accept 500 million cubic feet per day. Carbon dioxide flooding will extend the life of the field 20 to 25 years and is expected to produce an additional 280 million barrels of oil.



This well-drilling rig taps underground sources of carbon dioxide.



Pipeline trenchers such as this minimize surface disturbance.

Carbon dioxide reserves in Colorado exceed requirements for the Wasson field. The excess probably will be used sometime in the future at other projects in west Texas and New Mexico. The pipeline will ultimately be capable of carrying—and the source capable of producing—one billion cubic feet of carbon dioxide per day.

Cultural Resource Protection

When development occurs, there are two ways to mitigate the impacts on archaeological sites. If there is no way to avoid the site and it will be destroyed, an excavation must be done to save the data and learn as much as possible. Excavations, however, are time-consuming and costly. The alternative is avoidance. This is preferred in almost all cases.

To minimize disturbances to the area, the route for the pipeline was located along existing right-of-way corridors. In the carbon dioxide source fields, rights-of-way for powerlines, roads, and pipelines have been overlapped whenever possible. This will limit the disturbance area to approximately 60 feet instead of the 150 feet originally requested by the contractors. Pipeline ditches are

being dug by special trenching machines to avoid blasting rock. In many cases, electric power pole structures and lines are strung by helicopter to avoid driving over fragile archaeological resources. Consider the incredible feat of stringing a two-mile electrical transmission line across a canyon by helicopter!

Project construction occurs from late March to early November, depending upon weather conditions. With more than 1,500 employees working on the project, coordination and timing are crucial. Shell provides buses to transport people to their workplaces rather than have hundreds of vehicles driving over the area.

It's often during major projects like this that extensive cultural resource survey and research are done. Working with BLM and the Department of Anthropology at the University of Colorado, Shell developed a computer model to aid in avoiding environmentally sensitive areas, particularly where ancient Indian ruins might be present. The model was accepted by state and federal archaeologists—the first time a predictive model has been successfully used for archaeological planning purposes. This led to successful completion of an acceptable Environmental Impact Statement, thereby allowing Shell to pursue development.

The key to BLM's resource management program is balancing the use, development, conservation and protection of our natural resources. It's quite a program, one with many interested people.

Arrington says, "It's rewarding that the oil companies have the technology to do this type of development cost-effectively and not adversely affect the cultural resources." She also says, "A lot of credit must be given to the companies for their willingness to work with the Bureau in preserving cultural resource values." ▽

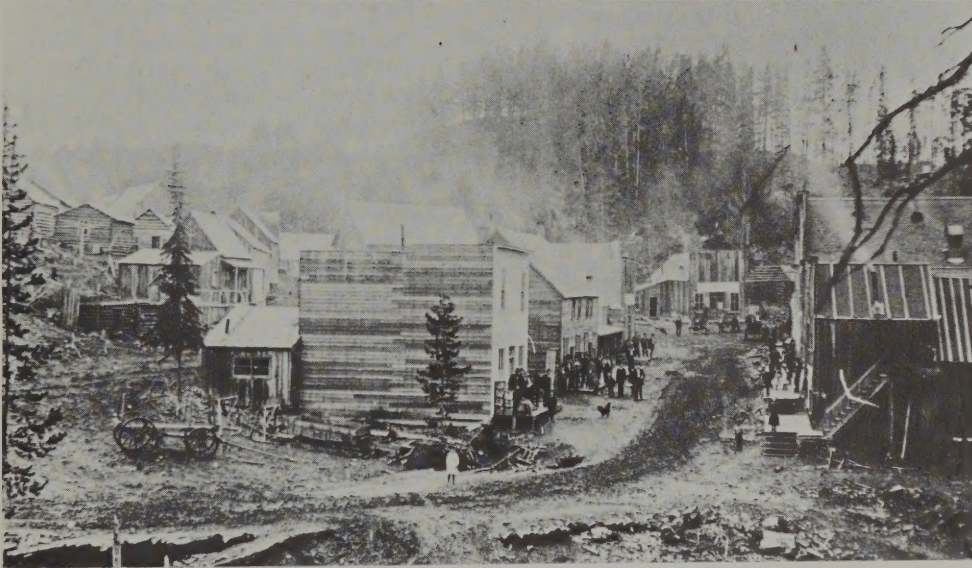
Carolyn Z. Roth is a public affairs specialist in the Bureau of Land Management's Colorado State Office in Denver.

Carbon dioxide will be piped 495 miles from southwestern Colorado to Texas oil fields for use in recovering additional petroleum.



Garnet, Typical Ghost Town

by Millard Hulse



Garnet, in western Montana, as it appeared just before the turn of the century.

Garnet was one of Montana's last boom towns, hastily built like many others after an economic panic in 1893 sent thousands of unemployed miners into the mountains seeking livelihoods working gold-bearing quartz lodes which were originally located by placer miners in the 1860s. Along with most of the other mountain mining camps, Garnet had run its economic course by 1910, its peak population of about 1,000 down to about 200.

Nothing particularly significant ever happened to or at Garnet, and therein, ironically, lies its significance today.

Montana historian John Ellingson says that the most important thing that ever happened to Garnet was its being chosen for preservation by the Bureau of Land Management (BLM). In his words, "Garnet has had no other truly significant event in its history. It did



Garnet, as it appeared on July 17, 1983, during Garnet Appreciation Day.

not produce the first gold, the last gold, the most gold, or the biggest nuggets. It did not originate, or even have, vigilantes, did not become a territorial capital and did not start any political reforms. It was not excessively violent, nor

was it without its lawlessness. It did not produce the gold that saved the Union in the Civil War or Montana's economy in the panic of 1893. Its citizens did not become presidents, governors, senators, or even millionaires. Its architecture was



BLM Photo by Doug Haberman

During the Garnet Work Week in 1983, retired BLM District Manager Don Mellgren (foreground) and Garnet Preservation Association President Ike Leigland put siding back on Davey's Store that was specially milled to match the former style.

not outstanding; it was downright plain in comparison to some other towns, and it was built in a shoddy and rather unartistic way. "But these things add up to make Garnet significant in another way. The typical western ghost town, the one in which the majority of the miners and pioneers lived and worked, was not colorful or outstanding. Garnet is the typical western ghost town. And that is truly significant."

For several years, BLM has been searching for ways to preserve the ghost town of Garnet in western Montana. Help from volunteers is now improving prospects considerably.

In 1970, the Bureau selected Garnet as the one ghost town out of more than 200 in Montana it would try to preserve. BLM-funded work on the old buildings began that year and continued through the 70's with support and cooperation from the University of Montana and the Montana Historical Society. Over the years, the Bureau received many plaudits for its work and enough publicity to develop a sizeable visitor population. The Bureau kept the stabilization work going and hired a caretaker to put a stop to vandalism and arson which had plagued the site in the 60's.

But by 1981, it had become apparent that even the most ingenious budget-stretching could

no longer keep the rather ambitious program afloat.

Enter the Garnet Preservation Association (GPA). In late 1981, the problem at Garnet came into sharp focus through a series of public meetings chaired by John Toole, a prominent Missoula civic leader. Soon afterward, a determined cadre of local citizens spearheaded by Ike Leigland, Helen Hammond, Kathy Likvan, and Melanie Mellgren took on the task of doing something about it.

Working hand-in-hand with Garnet Resource Area Manager Darrel Sall and Chuck Hollenbaugh, recreation program leader, the steering committee defined its role in by-laws and a cooperative agreement with BLM. In June 1983, the group incorporated as the Garnet Preservation Association, a non-profit corporation. Since then, the Association has expanded its numbers to more than 80 card-carrying families.

A local radio station had been sparkplugging the Association's operations from its inception, and in the summer of 1982, promoted the first Garnet Appreciation Day. The annual event blossomed even more successfully last July when 500 folks gathered to enjoy themselves picnicking, taking tours with Garnet native Frank Fitzgerald and listening to some good, old-time fiddle music.

A call for workers to make "hands-on" contributions during Garnet Work Week in August was

answered by 30 volunteers. In September, five members of Missoula Carpenter's Local 28 donated much-needed skills on a day off to make crucial repairs.

Working from the newly opened visitor's center in Ole's Saloon, the Association raised funds last summer by selling T-shirts, historic photographs, postcards and Helen Hammond's 50-page booklet, "Garnet: Montana's Last Gold Camp." These items are still available by mail from the Garnet Preservation Association, P.O. Box 8531, Missoula, Montana 59807.

GPA's most recent venture was directed by volunteers Doug and Rose Habermann. A cabin used by BLM's fire crew in the summer was rented this past winter for \$20 per night to cross-country skiers and snowmobilers, frequent cold weather visitors at Garnet.

The Association hopes to eventually take over full management responsibility for Garnet. This year GPA plans to expand, as finances permit, into land acquisition to clean up the numerous slivers of mining claims that still remain in private ownership. Ike Leigland, GPA president, is hopeful for the future. "The active government/private citizen effort and the 7,000-plus visitors made for an excellent first year," he said recently. "It appears Garnet is a ghost town with a future as well as a past."

Butte District Manager Jack McIntosh is cautiously optimistic about the Association's prospects. "It's gratifying to see the public support that has come to the aid of the Garnet project," he says, "We only can hope that it turns out to be enough and in time. The public investment that's been made at Garnet has been worthwhile, and will be even more worthwhile for our children and our grandchildren." ▽

Millard Hulse is the public affairs specialist in the Bureau of Land Management's Butte District in Montana.

Training To Do

by Paul Rigtrup

Twenty-five Bureau of Land Management (BLM) petroleum technician training is the latest addition to a varied list of "hands-on" training conducted by BLM's Phoenix Training Center.

Since the training center's birth as the Lands and Minerals School in 1969, BLM employees have examined mining claims, traversed metes and bounds surveys, documented livestock trespasses, monitored wildlife habitat, and in some cases, testified about these activities before a judge in mock courtroom hearings. These exercises bring a level of realism to Phoenix Training Center programs that is not often found in other kinds of training. Learning by doing is stressed, augmenting academic training available at colleges. Participants are trained to do their jobs better.

To add special touches of realism to the training, the old Lands and Minerals School was placed in BLM's Phoenix District where lands trainees could actually work cases for the District. The minerals trainees were sent on three-week details to their assigned districts to gain experience on which to base subsequent training.

Classroom instruction is presented by visiting instructors, not permanent staff, and the instructors are drawn from all parts of the agency's organization. From

time to time, public land users from the private sector are brought in to share their perspectives with BLM's newest employees.

Expanded Offerings

As BLM's responsibilities expanded during the decade of the seventies, daily experiences in resource management practices in the Districts were shared with trainees. Many significant developments were presented in Training Center sessions before "new doctrine" and procedures were written into formal directives. Frequently, the Training Center instructors also drafted new regulations and procedures. Even though the original objective of the Training Center was to provide comprehensive training programs for beginning-level lands and mineral specialists, it was no time at all before the effort began to spin off related course work for other groups, including specialists who were already in mid-career. These courses included lands and minerals policy seminars for BLM

executives, and a three-course training program was developed for BLM's lands and minerals adjudicators. Another three-week course was organized for managers who had no previous lands or minerals experience.

The increased productivity and professionalism of comprehensively trained new professional employees generated a flurry of testimonials to the cost-effectiveness of the training. Cost-benefit analyses preceded the launching of similar programs in range and wildlife in 1978 and 1980. The addition of the range program in 1978 forced the Training Center into new temporary quarters. By October 1979, the Training Center was separated from the District and was placed under the supervision of the Arizona State Director, in two separate buildings.

On Saint Patrick's Day, 1980, the Training Center occupied its present quarters at the Nineteenth Avenue Business Center, gaining for the first time a complete training facility with nine classrooms,



New BLM geologists and mining engineers tour mining facilities during job orientation.

staff offices, duplicating and audiovisual spaces, all under one roof and capable of supporting a first-rate training program.

Trainees Learn by Doing

During calendar year 1982, twenty-five training courses were presented by the Training Center for 700 trainees. These included manager training in management methods and in minerals management, eight classes of beginning-level professionals, five administrative law seminars, eight technical short courses and one instructor training seminar.

Consolidation of all onshore minerals responsibilities in BLM resulted in the addition of eight new technical courses in 1983, some of them involving unusual sensitivity and urgency.

Although the center is located in an office building, the previous tenant had been a court reporting school. The building was well adapted to use as BLM's training facility, even including a judge's bench and witness stand to add to the realism of mock courtroom hearings. Classrooms have been given names such as "Homestead," "Public Domain," "Prospector," and "NE ¼."

Today, BLM's Phoenix Training Center serves top managers and new employees alike, sponsoring training in fields as diverse as data processing, conflict management, oil patch operations, land appraisals, right-of-way management, environmental protection, and others. With all of the changes, the emphasis set at the school's inception 15 years ago still remains on "doing"—doing a better job of managing the Nation's public lands and resources. ▽

Paul Rigtrup served as Manager of the Phoenix Training Center from 1972 to 1984.

Earthquake Aftermath

by Alan Wood and Don Smith

The Idaho earthquake that rattled windows in the Salmon District Office on October 28, 1983, left a crack across Bureau of Land Management (BLM) and Forest Service lands that is 24 miles long. The earthquake was centered near the base of Mt. Borah in Custer County, between Challis and Mackay.

BLM crews, traveling by trucks and helicopter, by January had determined that 40 miles of roads had been damaged by the quake. Also damaged were several water pipelines and a mile of fence. Road damage consisted mainly of large cracks and debris. However, in the area of the surface rupture, some sections of road dropped 10 to 15 feet and will require realignment. The road to the upper Herd Lake campground became so unstable that it was closed to all motorized traffic.

While road damage will be costly to repair, it can be readily identified. The major problem in the Challis-Mackay Resource Area concerns water. There are hun-

dreds of miles of spring-fed underground pipelines which supply water for livestock and wildlife. The earthquake caused major changes in the local groundwater system, and since most of the pipelines had been shut off and winterized at the time of the quake, the full extent of damage can only be assessed as systems are reactivated for the grazing season. Several springs in the area stopped flowing, which could result in entire systems no longer being functional.

The aquifer is often capricious natured. For example, one spring with a flow of eight cubic feet per second completely stopped flowing. While alternatives were being considered on how to handle the lack of water, the spring started to come back. Soon afterwards, it was flowing at 44 cubic feet per second or five times its normal flow, and the Corps of Engineers had to alter the stream channel to handle the additional flow and prevent flooding.

While the earthquake did do

considerable damage, its occurrence in an isolated area on public lands provides an ideal situation for the study of the phenomenon. ▽

Don Smith is the area manager for the Challis-Mackay Resource Area and Alan Wood is a forester and the public affairs specialist in the Bureau of Land Management's Salmon District in Idaho.

Ruptures in the Mt. Borah road rendered it impassable.



Photo by Sue Villard, copyright 1983, Curtis Publishing, Inc.

Outdoor Learning in Alaska

by Joette Storm



Volunteers from several agencies and organizations introduce students to environmental values and natural resource management practices near Anchorage, Alaska.

The spring sun is shining. Cottonwood trees disperse their sweet perfume through the woods. It is Alaska Outdoor Week and Anchorage area school children battling the onset of spring fever are piling out of buses and scrambling along a path to start an outdoor learning adventure.

Since 1975, the second week in May has become synonymous with the term Outdoor Week. Cosponsored by the Bureau of Land Management's (BLM) Anchorage District Office and the local school district, it is an environmental education program designed to provide sixth grade students with an opportunity to learn about various aspects of the natural area known as the Campbell Tract.

Located on the edge of the city, Campbell Tract is a 750-acre BLM administrative site which serves as headquarters for the District Office. There amid spruce, willow and fiddlehead ferns, the children hike to a series of learning stations where they may gather edible plants, sample water from the creek, or practice traditional native camping skills.

The stations are staffed by resource specialists from local, state and federal agencies as well as citizen groups such as the Alaska Center for the Environment and the Audubon Society. Individuals may work the full week or just a day, but in all it requires 80 person-days to operate the session for thousands of young participants.

Although these children live in the midst of one of the last great wilderness areas, says Emma Walton, school science consultant, many of them rarely venture from the city to experience the joys of nature.

Recognizing this, it was BLM fire management officer Les Rosenkrance who approached the school district in 1975 about starting the program. Rosenkrance had seen one like it in Idaho and was eager to have a similar program for his own children and their friends. With the help of the school administration, other agencies were enlisted to participate and the program was off the ground.

Over the years, the program has become so popular with teachers

and students that it has been expanded to include a winter session with emphasis on winter survival skills. That session is organized principally by the military forces at nearby Air Force and Army bases. ▽

Joette Storm is the public affairs specialist in the Bureau of Land Management's Anchorage District.



Students learn about soil properties, classification, and conservation during Alaska Outdoor Week.

SERVICES PROVIDED BY THE BUREAU OF LAND MANAGEMENT

Since 1812, the Bureau of Land Management (BLM) and its predecessor agencies have provided a variety of services to the public. All land west of the first thirteen states was the original public domain. From it, most of the national forest, national park, and national wildlife refuge systems were created. The lands best suited for agriculture passed into private ownership. Congress provided major grants of land to states, colleges, and railroads.

All of the public lands remaining after such transfers are managed by BLM.

Management of these public lands by BLM is decentralized to 12 state offices, which guide the management of the natural resources of the lands in 55 districts and their 154 resource areas.

Specific information about opportunities to enjoy the benefits of BLM lands and resources can best be obtained from the state office or district office responsible for the area of interest.

Most BLM lands are available for a wide variety of recreational activities, including sight seeing, picnicking, camping, hunting, fishing, watching wild horses and other wildlife, boating, skiing, and rock hounding. A map brochure called "Camping on the Public Lands," which lists principal recreation sites, is available from all BLM offices. Limitations on kinds, seasons, or areas of use apply in certain localities.

About 21,000 livestock operators pay grazing fees for the use of BLM rangelands, in accordance with permits and leases issued by district managers.

District managers sell about a billion board feet of timber annually in competitive auctions. Following harvest, the timberlands are promptly reforested and the new stands are carefully tended.

Minerals are made available for public use in several ways. Certain common minerals—like sand, gravel, and rock for road construction—are sold to the users at fair market values.

Locatable minerals—like gold, mercury, uranium, molybdenum, copper, etc.—can be claimed by filing a notice of location in the appropriate county and BLM state office, provided that the federal land is open to location and previous mining claims have not been filed. Records of mining claims are maintained by BLM state offices.

Leasable minerals—like oil, gas, coal, geothermal, nitrates of potassium and sodium, etc.—can be acquired by one of three methods, depending on the circumstance. Lands from which minerals may be extracted may be leased: (1) competitively; (2) over-the-counter on a first come, first served basis; or (3) if the lands have been leased previously, by drawings to select lessees from among those persons whose applications are

considered to have been filed simultaneously. Regardless of the means by which a lease is acquired, royalty payments based on a percentage of the value of the mineral are paid as the mineral is extracted. Information about the availability of mineral leases can be obtained from BLM state offices.

The Federal Land Policy and Management Act of 1976 established the policy that BLM public lands are to be managed under principles of multiple use and sustained yield in accordance with resource management plans developed with public involvement. Harmonious and coordinated management of the various resources is

designed to ensure the productivity of the land and the quality of the environment.

If as a result of land use planning, it is determined that certain parcels of land are surplus to federal needs, title to them may be transferred to other owners. Information about opportunities to purchase such lands may be obtained from BLM state offices. Generally, lands are competitively sold at not less than appraised values.

All Americans benefit either directly from the use of BLM lands and the resources they produce or indirectly from the resource revenues that go to the U.S. Treasury.

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT STATE OFFICES

ALASKA STATE OFFICE

Bureau of Land Management
701 C Street
P.O. Box 13
Anchorage, AK 99513

ARIZONA STATE OFFICE

Bureau of Land Management
2400 Valley Bank Center
Phoenix, AZ 85073

CALIFORNIA STATE OFFICE

Bureau of Land Management
Federal Building, Room E-2841
2800 Cottage Way
Sacramento, CA 95825

COLORADO STATE OFFICE (ALSO KANSAS)

Bureau of Land Management
1037 20th Street
Denver, CO 80202

EASTERN STATES OFFICE

(states bordering and east of Mississippi River)
Bureau of Land Management
350 South Pickett Street
Alexandria, VA 22304

IDAHO STATE OFFICE

Bureau of Land Management
3380 Americana Terrace
Boise, ID 83706

MONTANA STATE OFFICE (ALSO NORTH DAKOTA AND SOUTH DAKOTA)

Bureau of Land Management
222 N. 32nd Street
P.O. Box 36800
Billings, MT 59107

NEVADA STATE OFFICE

Bureau of Land Management
300 Booth Street
P.O. Box 12000
Reno, NV 89520

NEW MEXICO STATE OFFICE

(ALSO OKLAHOMA AND TEXAS)

Bureau of Land Management
South Federal Place
P.O. Box 1449
Santa Fe, NW 87501

OREGON STATE OFFICE (ALSO WASHINGTON)

Bureau of Land Management
825 NE Multnomah Street
P.O. Box 2965
Portland, Oregon 97208

UTAH STATE OFFICE

Bureau of Land Management
136 East South Temple
Salt Lake City, UT 84111

WYOMING STATE OFFICE (ALSO NEBRASKA)

Bureau of Land Management
2515 Warren Avenue
P.O. Box 1828
Cheyenne, WY 82001

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